

What is claimed is:

509 B1 1. A method for adapting a general purpose query protocol
2 for use by an industrial control system, the industrial
3 control system including a controller for providing control,
4 via a network for communication according to a model
5 compatible with the Open Systems Interconnection (OSI) seven-
6 layer model, over an industrial process through at least one
7 control element and at least one monitoring element, each
8 coupled to the network via a network I/O device, the
9 controller for performing communication with the network I/O
10 devices according to the general purpose query protocol, the
11 method comprising the step of:

12 a) making a permanent-type connection to the network I/O
13 device for the control element or for the monitoring
14 element based on an analysis of communication transactions
15 between the controller and the control element or the
16 monitoring element;
17 thereby specializing the general purpose query protocol,
18 which would ordinarily be used in computer-to-computer
19 communications for making ad hoc queries of an external
20 device, to use by the industrial control system in performing
21 frequent communication of control and monitoring information
22 between the controller and the control element or the
23 monitoring element of the industrial control system.

1 2. The method as claimed in claim 1, wherein the permanent-
2 type connection is a connection, at the transport layer of
3 the network communication model, that is left open for later
4 use after an earlier use.

1 3. The method as claimed in claim 2, further comprising the
2 step of:

3 *Sub* a) making available use of ~~a protocol~~ in which a single
DZ command from the controller performs both a read register
4 and a write register instruction.
5

1 *Sub* 4. The method as claimed in claim 3, wherein the protocol is
Az compatible with the open MODBUS/TCP protocol.
2

1 5. The method as claimed in claim 4, further comprising the
2 steps of:

3 a) rate tuning the controller so as to adjust how often to
4 communicate with the control element or the monitoring
5 element; and

6 b) duration tuning the controller so as to adjust how long to
7 wait for the control element or the monitoring element to
8 respond to a query.

1 6. The method as claimed in claim 5, wherein the network is
2 an Ethernet-type network.

1 7. The method as claimed in claim 6, wherein the controller
2 is a programmable logic controller (PLC).